

We claim:

1. An internal combustion engine aftertreatment system for treating exhaust gases exiting an engine, the system comprising:
 - 5 a sulfur trap having a sulfur trap input operatively coupled to the engine exhaust and having a sulfur trap output;
a catalytic soot filter having a soot filter input operatively coupled to the sulfur trap output and having a soot filter output;
a valve system having a valve input operatively coupled to the soot filter output, a
10 first valve output and having a second valve output;
an adsorber having an adsorber input operatively coupled to the first valve output and having an adsorber output;
a bypass pathway having a bypass input operatively coupled to the second valve output and having a bypass output operatively coupled to the adsorber output; and
15 a diesel oxidation catalyst having a DOC input operatively coupled to the adsorber output and to the bypass output and having a DOC output.
2. An internal combustion engine aftertreatment system for treating exhaust gases exiting an engine, the system comprising:
 - 20 a valve system having a valve input operatively coupled to the engine exhaust, a first valve output and having a second valve output;
an adsorber having an adsorber input operatively coupled to the first valve output and having an adsorber output; and

a bypass pathway having a bypass input operatively coupled to the second valve output and having a bypass output operatively coupled to the adsorber output.

3. The system of claim 2, further comprising:

5 a sulfur trap having a sulfur trap input operatively coupled to the engine exhaust and having a sulfur trap output operatively coupled to the valve system input.

4. The system of claim 3, further comprising:

a catalytic soot filter having a soot filter input operatively coupled to the sulfur trap
10 output and having a soot filter output operatively coupled to the valve system input.

5. The system of claim 2, further comprising:

a diesel oxidation catalyst having a DOC input operatively coupled to the adsorber
output and to the bypass output and having a DOC output.
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6. The system of claim 2, further comprising:

a supply of fuel;
a pump having a pump inlet operatively coupled to the supply of fuel and having
a pump outlet;
20 a fuel injector having an injector input operatively coupled to the pump outlet and
having an injector output operatively coupled to the adsorber input.

7. The system of claim 6, further comprising:

an igniter operatively coupled to the adsorber input.

8. The system of claim 2, further comprising:

5 a temperature and lambda sensor having a sensor input operatively coupled to the valve system input.

9. The system of claim 2, further comprising:

10 an NOx sensor having an NOx sensor input operatively coupled to the adsorber output.

10. The system of claim 2, wherein the valve system comprises a proportional control 3-way valve.

11. An internal combustion engine aftertreatment system for treating exhaust gases exiting
15 an engine, the system comprising:
a valve system having a valve input operatively coupled to the engine exhaust, a first valve output and having a second valve output;
a catalytic soot filter having a soot filter input operatively coupled to the valve system output and having a soot filter output;
20 an adsorber having an adsorber input operatively coupled to the soot filter output and having an adsorber output; and
a bypass pathway having a bypass input operatively coupled to the second valve output and having a bypass output operatively coupled to the adsorber output.

12. The system of claim 11, further comprising:

a sulfur trap having a sulfur trap input operatively coupled to the engine exhaust and having a sulfur trap output operatively coupled to the valve system input.

5 13. The system of claim 11, further comprising:

a diesel oxidation catalyst having a DOC input operatively coupled to the adsorber output and to the bypass output and having a DOC output.

14. The system of claim 11, further comprising:

10 a supply of fuel;

a pump having a pump inlet operatively coupled to the supply of fuel and having a pump outlet;

a fuel injector having an injector input operatively coupled to the pump outlet and having an injector output operatively coupled to the soot filter input.

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15. The system of claim 14, further comprising:

an igniter operatively coupled to the soot filter input.

16. The system of claim 11, further comprising:

20 a temperature and lambda sensor having a sensor input operatively coupled to the valve system input.

17. The system of claim 11, further comprising:

an NOx sensor having an NOx sensor input operatively coupled to the adsorber output.

18. The system of claim 11, wherein the valve system comprises a proportional control 3-
5 way valve.

19. An internal combustion engine aftertreatment system for treating exhaust gases exiting
an engine, the system comprising:
a valve system having a valve input operatively coupled to the engine exhaust, a first
10 valve output and having a second valve output;
an adsorber having an adsorber input operatively coupled to the first valve output and
having an adsorber output;
a bypass pathway having a bypass input operatively coupled to the second valve
output and having a bypass output; and
15 a catalytic soot filter having a soot filter input operatively coupled to the adsorber
output and the bypass output and having a soot filter output.

20. The system of claim 19, further comprising:
a sulfur trap having a sulfur trap input operatively coupled to the engine exhaust and
20 having a sulfur trap output operatively coupled to the valve system input.

21. The system of claim 19, further comprising:
a supply of fuel;

a pump having a pump inlet operatively coupled to the supply of fuel and having a pump outlet;

a fuel injector having an injector input operatively coupled to the pump outlet and having an injector output operatively coupled to the adsorber input.

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22. The system of claim 21, further comprising:

an igniter operatively coupled to the adsorber input.

23. The system of claim 19, further comprising:

10 a temperature and lambda sensor having a sensor input operatively coupled to the valve system input.

24. The system of claim 19, further comprising:

15 an NOx sensor having an NOx sensor input operatively coupled to the adsorber output.

25. The system of claim 19, wherein the valve system comprises a proportional control 3-way valve.

20 26. An internal combustion engine aftertreatment system for treating exhaust gases exiting an engine, the system comprising:

a catalytic soot filter having a soot filter input operatively coupled to the engine exhaust and having a soot filter output;

a sulfur trap having a sulfur trap input operatively coupled to the filter output and having a sulfur trap output;

a valve system having a valve input operatively coupled to the sulfur trap output, a first valve output and having a second valve output;

5 an adsorber having an adsorber input operatively coupled to the first valve output and having an adsorber output;

a bypass pathway having a bypass input operatively coupled to the second valve output and having a bypass output operatively coupled to the adsorber output; and

a diesel oxidation catalyst having a DOC input operatively coupled to the adsorber
10 output and to the bypass output and having a DOC output.

27. The system of claim 26, further comprising:

a supply of fuel;

a pump having a pump inlet operatively coupled to the supply of fuel and having
15 a pump outlet;

a fuel injector having an injector input operatively coupled to the pump outlet and having an injector output operatively coupled to the adsorber input.

28. The system of claim 27, further comprising:

20 an igniter operatively coupled to the adsorber input.

29. The system of claim 26, further comprising:

a temperature and lamda sensor having a sensor input operatively coupled to the valve system input.

30. The system of claim 26, further comprising:

5 an NOx sensor having an NOx sensor input operatively coupled to the adsorber output.

31. The system of claim 26, wherein the valve system comprises a proportional control 3-way valve.

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